Rewrite Title:

AIR FLOW MEASURING DEVICE HAVING A CURVED SUB-PASSAGE

Replace paragraphs beginning at page 2, lines 9 and 14:

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In an object of the present invention, an air flow measuring device comprising a housing with a sub-passage having an inlet and an outlet for air flow formed in the housing is provided. The sub-passage has a predefined curvature with a maximum downstream point. Also, a flow measuring element is located in the sub-passage at a position at least further downstream from the point.

In another object of the invention, an engine comprising an engine control unit and an air flow measuring device electrically coupled to the engine control unit for measuring air flow is provided. The air flow measuring device comprises a housing with a sub-passage having an inlet and an outlet for air flow formed in the housing. The sub-passage has a predefined curvature with a maximum downstream point. Also, a flow measuring element is located in the sub-passage at a position at least further downstream from the point.

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Referring now to drawings, Fig. 1 illustrates a cross-sectional view of an air flow measuring device of the present invention. The air flow measuring device is preferably a heating resistor type. In an air intake passage 1 of an automobile internal combustion engine, a module housing 2 for a heating resistor type air flow measuring device is installed through a module flange 5. A sub-passage 7 is formed at the end of the module housing 2 and a flow measuring element 3 is installed inside the sub-passage 7. The flow measuring element 3 is electrically connected with an electronic circuit 4 installed in the module housing 2 and the electronic circuit 4 is electrically connected with the outside through a connector 6. The sub-passage 7 contains a sub-passage inlet 9 whose opening face is perpendicular to the air flow into the air intake passage 1 and a sub-passage outlet 10 whose opening face is parallel to the air flow into the air intake passage 1. In other words, the direction of the air flow is inline with the inlet 9 and the air flow exits outlet 10 in a direction which is perpendicular to the entering air flow. Sub-passage 7 has a semi-circular bottom bend 8 with a predefined curved surface and the flow measuring element 3 is located on the downstream side of the bend of the sub-passage 7. Bottom bend 8 has a maximum downstream point 8a (shown in Fig. 1) at or near the apex of the curvature. Hence, air flow enters inlet 9 and travels in a direction upstream 8b (shown in Fig. 1) to the maximum downstream point 8a and travels in a direction downstream 8c (shown in Fig. 1) toward outlet 10. Hence, dust particles or other foreign matter which has entered sub-passage 7 travels along the outer wall surface 71 (as shown in Fig. 3) at the sub-passage bottom bend 8 by inertial force based on the velocity and weight of the dust particle or

foreign matter. Thus, the dust particles or other foreign matter does not interfere with the flow measuring element 3 located around the maximum downstream point 8a of the sub-passage bottom bend 8 and is discharged to the air intake passage 1 through the sub-passage outlet 10.

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Replace paragraph beginning at page 10, line 11:

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Fig. 7 illustrates a cross-sectional view of a modified version of the sub-passage structure as shown in Fig. 1. The sub-passage 7 has a sub-passage inlet 9 with an opening face which is perpendicular to the air flow in the air intake passage 1 and a sub-passage outlet 10 with an opening face parallel to the air flow in the air intake passage 1. Sub-passage 7 has a semi-circular bottom bend with a predefined curved surface and the flow measuring element 3 is located on the downstream side of the bend of the sub-passage 7. Bottom bend 8 has a maximum downstream point 8a (shown in Fig. 1) at or near the apex of the curvature. Hence, air flow enters inlet 9 and travels in a direction upstream 8b (shown in Fig. 1) to the maximum downstream point 8a and travels in a direction downstream 8c (shown in Fig. 1) toward outlet 10. Hence, since dust particles or other foreign matter which has entered sub-passage 7 travels along the outer wall surface 71 (as shown in Fig. 3) at the sub-passage bottom bend 8 by inertial force based on the velocity and weight of the dust particle or foreign matte, it does not interfere with the flow measuring element 3 located downstream from the maximum downstream point 8a of the

sub-passage bottom bend 8 and is discharged to the air intake passage 1 through the sub-passage outlet 10.

Replace paragraphs beginning at page 11, line 18 and page 12, line 4:

Fig. 8 illustrates a cross-sectional view of a modified version of the sub-passage structure as shown in Fig. 1. Here, a second vertical path bottom inclination 12a (shown in Fig. 8) is provided opposite to that of the first inclination 12. The second inclination 12a is also provided upstream from the maximum downstream point 8a. This design is suited to sub-passages which have a first vertical path 73, smaller than the one described in Fig. 7.

Figs. 9 and 10 show other embodiments, as modified versions of the embodiment shown in Fig. 7. Note, in both these embodiments, the air flow measuring element 3 is also provided downstream from the maximum downstream point 8a (shown in Fig. 7). Also, in the embodiment as described in Fig. 10, a second horizontal path 76 is shown. These embodiments produce substantially the same effect on dust particles and other foreign matter entering the sub-passage 7 as the one described in Fig. 7.